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APPLICATION FOR UNITED STATES LETTERS PATENT

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TITLE: LIFTING DEVICE

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LIFTING DEVICE

[0001] The present patent document is a continuation of PCT Application Serial Number PCT/EP2005/051223, filed March 16, 2005, designating the United States, which is hereby incorporated by reference.

BACKGROUND

Field

[0002] The ~~invention~~ present embodiments relates to a lifting device ~~having a top part and a bottom part, having a lifting linkage which connects the top part to the bottom part and has at least two sub-linkages connected to one another via a central articulation, and having a drive unit for adjusting the height of the top part~~.

Related Art

[0003] ~~Such l~~Lifting devices are generally known from the prior art~~.~~. ~~Thus, f~~For example, WO ~~98/46137~~ discloses ~~such~~ a lifting device ~~for adjusting~~that adjusts the height of a patient support~~.~~. ~~In this case, p~~Parallelogram structures are used as lifting linkages~~.~~. The ~~disadvantage with the~~ known structures ~~is that they~~ require a ~~comparatively~~ large amount of installation space~~.~~. ~~Furthermore, particularly l~~Large lifting forces are necessary for height adjustment ~~and.~~. ~~t~~These ~~forces, in addition, are~~lifting forces are not constant~~.~~. ~~It is also the case that d~~Different displacement speeds arise during ~~the~~ height adjustment~~.~~. The known solutions, for example, are too large, involve too much design outlay and require excessively ~~complicated control means~~complicated controls~~.~~.

SUMMARY

~~[0002] In view of the above, it is an object of the present invention to provide a particularly straightforward lifting device. This object is achieved by a lifting device as claimed in claim 1 and a method as claimed in claim 8.~~

[0004] In one embodiment, a lifting device includes a top part and a bottom part. A lifting linkage connects the top part to the bottom part and has at least two sub-linkages connected to one another via a central articulation~~.~~. A drive unit is operable to adjust the height of the top part and act on the central articulation.

~~[0006]~~ ~~[0005]~~ ~~Accordingly, it is a basic idea of the invention to configure the lifting device such that t~~The drive unit acts on a central articulation of a multi-part lifting linkage~~.~~. This allows the lifting device to be of particularly straightforward and compact construction.

~~[0004] Advantageous embodiments of the invention can be gathered from the subclaims.~~

~~[0007]~~ ~~[0006]~~ In ~~a particularly advantageous embodiment of the invention~~one embodiment, a scissors structure is used as a sub-linkage (lifting rod)~~.~~. The amount of installation space which is required for the lifting device ~~can thus be~~is greatly ~~minimized~~ reduced in ~~relation~~ comparison to the known constructions~~.~~. ~~If~~ In another embodiment, the lifting linkage comprises~~,~~ ~~for example,~~ two scissors structures connected to one another in an articulated manner. ~~, then t~~This double scissors structure ~~can~~ may be used to adjust the height of a top part, for example, a patient support, provided on the top scissors assembly. ~~,~~ In this embodiment, the top part can be adjusted in an extremely confined amount of space.

~~[0008]~~ ~~[0007]~~ ~~Instead of a double scissors assembly~~In another embodiment, it is also possible to use, for example, a triple or quadruple scissors mechanism. ~~, if required by the application. When use is made of a~~A multiple scissors ~~structure, in~~

~~addition, the design results in a particularly~~structure has a high level of rigidity and bending strength when laterally occurring forces are absorbed.

~~[0009] [0008]~~ ~~According to a further embodiment of the invention~~In one embodiment, ~~it is particularly advantageous if~~ the drive unit is designed ~~for a~~to provide a rectilinear movement of the central articulation (joint) in the vertical direction~~.~~. ~~This is preferably achieved in that t~~The drive unit ~~acts~~ is provided directly beneath the central articulation~~.~~. ~~It is not just~~ The drive unit provides a constant displacement speed to the central articulation ~~which is achieved as a result.~~. The ~~device according to the invention is also distinguished by more or less constant~~drive unit provides operative forces and particularly precise synchronization to the central articulation~~.~~. ~~Since preferably just~~In this embodiment, because a single drive unit is used, there is no need for a~~ny~~ separate synchronization control~~.~~. In this embodiment, the lifting device does not require ~~A~~arcuate pivoting of the lifting linkage ~~and~~ or an associated need for more spac~~e~~ ~~are avoided~~.

~~[0010] [0009]~~ ~~Corresponding to a further embodiment~~In another embodiment, ~~it is advantageous if~~ the drive unit has a spindle and a motor~~.~~. ~~In relation to known solutions, which operate, in particular, with maintenance-intensive hydraulic cylinders, this type of drive unit is comparatively low-maintenance~~A spindle and a motor have relatively less maintenance than a hydraulic cylinder~~.~~. In one embodiment, ~~A particularly advantageous arrangement in this context has proven to be one in which~~ a vertically running spindle is driven, via a corresponding gear mechanism, by an electric motor with its axis of rotation ~~running perpendicularly~~perpendicular to the spindle axis~~.~~. This embodiment allows a ~~particularly~~ space-saving construction of the lifting device.

~~[0011] [0010]~~ In one embodiment, ~~T~~the spindle ~~used~~ is ~~preferably~~ a trapezoidal spindle~~.~~. The spindle is not limited to a ~~Instead of this~~ self-locking type of spindle.~~;~~ ~~it is also possible to~~ Other ~~use other~~ spindles may be used, for example, ball screw spindles~~.~~. In one embodiment, ~~T~~the spindle, motor and gear

mechanism are ~~preferably designed~~ embodied such that the spindle flanks are always subjected to the load~~.~~. ~~In contrast to h~~Hydraulic cylinders~~, of which the~~ have varying operating paths ~~vary,~~ depending on design.~~,~~ In one embodiment, ~~during operation,~~ the ~~present~~ drive unit is ~~thus free of play~~fixed, ~~i.e.~~for example, there is no return play.

~~[0012]~~ ~~[0011]~~ In a ~~further embodiment of the invention~~nother embodiment, the motor is fastened on the bottom part, for example, on a base plate~~.~~. ~~This has the advantage that~~Accordingly, there is sufficient space for the motor-control ~~means~~ above the motor~~.~~ ~~Furthermore,~~ tand there is no need for any moveable cable guide.

~~[0013]~~ ~~[0012]~~ ~~Instead of such a fixed motor, an~~In an alternative embodiment, ~~provides for~~ a moveable motor ~~which~~ is fastened on the central articulation and moves up and down on the spindle.

BRIEF DESCRIPTION OF THE DRAWINGS

~~[0012] The present invention is described hereinbelow with reference to exemplary embodiments which are explained in more detail with the aid of drawings, in which:~~

~~[0015]~~ ~~[0013]~~ FIGURE 1 ~~shows a~~ illustrates a perspective view of ~~a first embodiment of the invention~~lifting device according to a first embodiment,

~~[0016]~~ ~~[0014]~~ FIGURE 2 ~~shows~~ illustrates a perspective view of a lifting device according to a second embodiment ~~of the invention~~, and

~~[0017]~~ ~~[0015]~~ FIGURE 3 ~~shows~~ illustrates a plan view of a lifting device according to the second embodiment.

DETAILED DESCRIPTION

~~[0018]~~ ~~[0016]~~ ~~The~~ In one embodiment, as shown in Figure 1, a lifting device 1 ~~according to the invention essentially comprises~~ includes a bottom part, in the form of a base plate 2, a top part, in the form of a patient support 3, and a lifting linkage.~~,~~ ~~see **FIGURE 1**.~~ The lifting linkage ~~here~~ is configured as a double

scissors mechanism or double scissors structure 4.~~.~~ ~~It~~ The double scissors structure 4 comprises, for example, two scissors assemblies 5, 6 as sub-linkages, which are connected to one another ~~in an articulated manner~~by a central articulation (joint) 16.

~~[0019]~~ [0017] The bottom scissors assembly 6 is ~~connected to~~ supported by the base plate 2.~~.~~ The bottom scissors assembly 6 includes front scissor feet 7 and rear scissor feet 8.~~.~~ The front scissor feet 7 are connected to the base plate 2.~~.~~ ~~in an articulated manner by way of its front scissors feet 7.~~ As shown in Figure 2, ~~T~~the rear scissors feet 8 of the bottom scissors assembly 6 are connected to one another via a slide 9 ~~which, .~~. For example, when the double scissors structure 4 is opened and closed, the slide runs back and forth in the running direction 11 on a running rail 10 fastened on the base plate 2 ~~(see FIGURE 2)~~.

~~[0020]~~ [0018] In one embodiment, a horizontally arranged electric motor 12 is fastened on the base plate 2 b~~B~~etween the front and the rear scissors feet 7, 8 of the bottom scissors assembly 6. ~~, a horizontally arranged electric motor 12 is fastened on the base plate 2.~~ In an alternate embodiment, ~~A~~a hand crank (not illustrated) for emergency operation of the lifting device 1 ~~can be~~is attached ~~(not illustrated)~~ at that end of the electric motor 12 which is directed toward the rear scissors feet 8.~~.~~ The axis of rotation 13 of the electric motor 12 ~~here~~ runs parallel to the running direction 11 of the slide 9.~~.~~ There is sufficient space for arranging a motor-controller ~~means~~ (not depicted) above the electric motor 12.~~.~~ A toothed gear mechanism 14 that converts the rotary movement of the electric motor 12 into a linear movement of a telescopic spindle 15 is ~~L~~located between the front scissors feet 7.~~.~~ ~~is a toothed gear mechanism 14 which converts the rotary movement of the electric motor 12 into a linear movement of a telescopic spindle 15.~~ The spindle 15 ~~which runs~~ is operable perpendicular~~ly~~ to the axis of rotation 13 of the electric motor 12 and is arranged between the front scissors feet 7 and beneath the front central articulation 16 of the double scissors structure 4.~~.~~ In one embodiment, ~~T~~the ~~telescopic~~ spindle 15 is designed as a trapezoidal screw spindle

(ACME spindle) and has its spindle head connected in an articulated manner to the front central articulation 16 of the double scissors structure 4 via a transverse connection 17~~.~~. In another embodiment, the spindle 15 is a telescopic spindle~~.~~.

~~[0021]~~ ~~[0019]~~ For example, ~~F~~for a height adjustment of the patient support 3, the electric motor 12 is switched on and the telescopic spindle 15 is extended and retracted~~.~~. The central articulation 16 of the double scissors structure 4 ~~here~~ executes a rectilinear movement in the vertical direction 18 at a constant displacement speed~~, while~~ and the slide 9 moves in the running direction 11~~.~~. The axis of rotation 13 of the electric motor 12 ~~here~~ runs perpendicular~~ly~~ to the spindle 15 axis~~.~~. ~~For safety reasons, t~~In one embodiment, the gear mechanism 14 is a self-locking gear mechanism~~.~~ ~~The~~ The spindle flanks are ~~always~~ subjected to load~~, so that~~ and the telescopic spindle 15 does not exhibit any return play~~.~~. The absolute-value sensor of a measuring system is fitted directly (not depicted) on the telescopic spindle 15.

~~[0022]~~ ~~[0020]~~ ~~An~~ In an alternative embodiment, as shown in Figure 2, ~~provides~~ the lifting device includes a moveable motor 19~~, see **FIGURE 2.**~~. In this embodiment, ~~T~~the electric motor 19 ~~here~~ is fixed on the central articulation 16 of the double scissors structure 4 ~~and,~~ ~~.~~ ~~w~~For example, when the double scissors structure 4 opens and closes, the electric motor 19 moves up and down on a screw spindle 20 fixed on the base plate 2. ~~With this exception, this embodiment corresponds to the embodiment described above, in particular in respect of the operating principles.~~

~~[0023]~~ ~~[0021]~~ As shown in Figure 3, ~~In relation to conventional standings surfaces, the invention makes possible~~ a lifting device 1 ~~which~~ requires only a particularly small base surface area~~.~~. ~~, see **FIGURE 3**, which depicts a plan view of a lifting device without a top part.~~

[0022] While the invention has been described above by reference to various embodiments, it should be understood that many changes and modifications can be made without departing from the scope of the invention~~.~~. It is therefore intended

that the foregoing detailed description be regarded as illustrative rather than limiting, and that it be understood that it is the following claims, including all equivalents, that are intended to define the spirit and scope of this invention.

ABSTRACT

~~The invention relates to a~~A lifting device is provided~~.~~. The lifting device includes a top part and a bottom part~~.~~. A lifting linkage connects the top part to the bottom part and has at least two sub-linkages connected to one another via a central articulation~~.~~. A drive unit is operable to adjust the height of the top part and act on the central articulation.

~~[0024] (1) comprising a top part (3), a bottom part (2), a lifting rod assembly (4) that connects the top part (3) to the bottom part (2) and is provided with at least two partial rod assemblies (5,6) which are interconnected via a central joint (16), and a drive unit (12, 14, 15, 19) for adjusting the height of the top part (3). In order to create a particularly simple lifting device, the drive unit (12, 14, 15, 19) grips the central joint (16).~~